ComNav®

marine ltd

# Explorer V1 Series

## *V1T and V1C*

**THERMAL AND LOW LIGHT CAMERA SYSTEM**

## Installation & Operation Manual

Certified System™

ISO 9001

CE

**COMPLIES WITH**
**CE REGULATIONS**

**PN 29010088** V1.1

# Welcome

Congratulations on your purchase of ComNav Marine Ltd. Explorer V1T / Explorer V1C Camera System. At ComNav Marine Ltd., we are dedicated to reliability & quality in all our products, and the Explorer camera system is a good example of that. We promise to do our best to ensure your satisfaction with your new Explorer V1 Camera System.

## Warranty Notice

Prior to the installation and/or operation of the equipment, ensure that you read, understand, and accept the conditions of the warranties as detailed in the **Warranty Information** section of this manual.

## General Notice

This document, ComNav part number 29010088 Version 1 Revision 0, is the approved Installation and Operation Manual for use with Explorer V1T and V1C Camera System. Where versions of this manual exist in other languages, the English version shall be considered authoritative.

## Proprietary

The data in this publication shall not be disclosed without permission and shall not be duplicated, used, or disclosed in whole or in part except to the extent provided in any contract of which this document is made a part. This restriction does not limit the customer's right to use information contained in this document if it is obtainable from another source without restriction. The data subject to this restriction are contained in all sheets of this document and related drawings and document specifications herein. ComNav reserves the right to make changes to its products or specifications at any time, without notice, in order to improve design or performance and to supply the best possible product.

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## *Special Note*

*V1C – Explorer V1 series, low light camera system.*
*V1T – Explorer V1 series, Thermal imaging camera system.*

Please see appendix 2 for ordering information of all available camera systems and accessories.

Some Features detailed on sales brochures and/or in this manual, are available only with the advanced camera controller.

**WARNING: Thermal imaging systems are controlled by Canadian and International laws and are subject to export controls. Please contact ComNav Marine Ltd. with any question concerning export compliance for the application or geographic location of the installation or use of this Thermal camera system.**

There are various versions of this thermal camera system that are approved for international distribution.

Please contact ComNav Marine Ltd. if you have any questions.

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## Document History

| Revision | By | Description |
|---|---|---|
| 1R0 | AB | first release |
| 1R1 | AB | part numbers change and mounting plate zero point label |
| | | |
| | | |
| | | |
| | | |
| | | |

## About this Manual

This manual provides essential information for the safe and reliable operation of the ComNav Explorer V1 Camera System. Read this manual in its entirety before using the Camera System for the first time. Keep the manual handy until you become thoroughly familiar with the operation of the Explorer V1 camera system.

***Note:*** *most of the information in this manual applies to both models of the Explorer V1 Camera System: the Explorer V1T and the Explorer V1C.*

*For easier reading, most references in the text use "V1" – but it should always be understood as referring to both models. Whenever a particular item applies only to the V1T or the V1C, it will be so stated in the text of that item.*

### Manual Format

This manual has been formatted to be printed on both sides of a standard Letter sized paper (8.5" x 11").

If you have obtained this manual as a soft-copy, please note that it is in Adobe® Portable Document Format ("PDF"), and may be viewed & printed with Adobe Reader®, or compatible PDF-format viewers.

When printing this manual, select "duplex printing" (or the equivalent term used by your printer's software driver), in order to print it in a double-sided format. If your printer does not have built-in duplexing capability, you can still print this manual double-sided by following the instructions that came with your printer for doing "hand duplexing".

You should also select the Auto-Rotate and Centre option in the Print Dialog box, de-select the Choose Paper Source by PDF page size option. Set Page Scaling to None – Reader's default setting is Shrink to Printable Area, and is printer-dependant (usually set at ~97%), but it is not needed in this instance.

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# Introduction

## When You Open the Box

- Check that the packaging and the contents are not visibly damaged.
- Contact your supplier immediately if any of the parts listed below are missing or damaged

### Camera Package Contents

| Item | Part # | Description | Quantity |
|---|---|---|---|
| 1 | 21610005<br>21610006<br>21610007/9<br>21610008/10 | V1C Low Light camera - NTSC<br>V1C Low Light camera - PAL<br>V1T Thermal camera - NTSC 9Hz/30Hz<br>V1T Thermal camera - PAL 9Hz/30Hz | 1 |
| 2 | 31610023 | Flush Mount Fixing Plate / White | 1 |
| 3 | 31610024 | Fixing Screw - Plate to Camera | 3 |
| 4 | 31610025 | Fixing Screw - Plate to Boat | 3 |
| 5 | 31610026 | Security Driver | 1 |
| 6 | 31610003 | Umbilical Cable | 1 |
| 7 | 29010088 | Installation / Operating Manual | 1 |

**Table 1 - Explorer V1T / V1C Camera Box Content**

### Joystick Package Contents

| Item | Part # | Description | Quantity |
|---|---|---|---|
| 1 | 31610015 | Controller Unit | 1 |
| 2 | 31610016<br>31610018 | Joystick Controller V1C<br>Joystick Controller V1T | 1 |
| 3 | 31610020 | Power cable Tail | 1 |
| 4 | 31610021 | Data To Camera cable tail | 1 |
| 5 | 31610019 | Joystick Cable (3M CAT5 STP) | 1 |
| | | | |

**Table 2 - Explorer V1T / V1C Joystick Box Content**

## Safety Notes!

The following important notes must be followed carefully to run the camera and respective accessories such as keypad controllers etc. The camera and accessories are referred to as 'Camera system' hereafter in this document.

- The Explorer V1T Thermal imaging camera is designed to be used in conjunction with other navigational aids and should not be used as the sole or primary navigation device.
- ***Some Thermal Imaging Camera models cannot be exported to certain territories without specific Export Licenses which must be obtained from the relevant trade and industry bodies prior to exportation. Failure to observe strict import and export regulations is a serious offense. Ensure the correct licenses are obtained where necessary. For further information contact your Comnav dealer or Comnav support. Contact details can be found within this document***.
- Before installing the camera, please read this manual carefully. During installation follow the instructions indicated in this manual. Please keep this manual safe for future reference. An up to date copy is available on our website: www.comnav.com
- The installation of the Camera system including this camera and any associated accessories, should be carried out by qualified service personnel or system installers in accordance with local regulations.
- Before powering the camera please check the supply voltage and ensure the power supply is safely isolated using an appropriately rated fuse or circuit breaker. Verify that the supply power is within acceptable range (See specifications, page 32).
- Please ensure the power, video and data umbilical are stowed safely and that terminations to third party hardware or extension cables are properly shielded from moisture
- Do not operate the camera beyond the specified temperature and humidity limits
- To prevent electric shock, never remove the screws or the cover of the camera. There are no user serviceable parts within the camera housing. Refer to qualified and approved Comnav service personnel for servicing
- Never aim the camera at the sun or other extremely bright objects
- ***Do not manually move the camera even when it is not powered***

# Introducing the Explorer V1 Camera Series

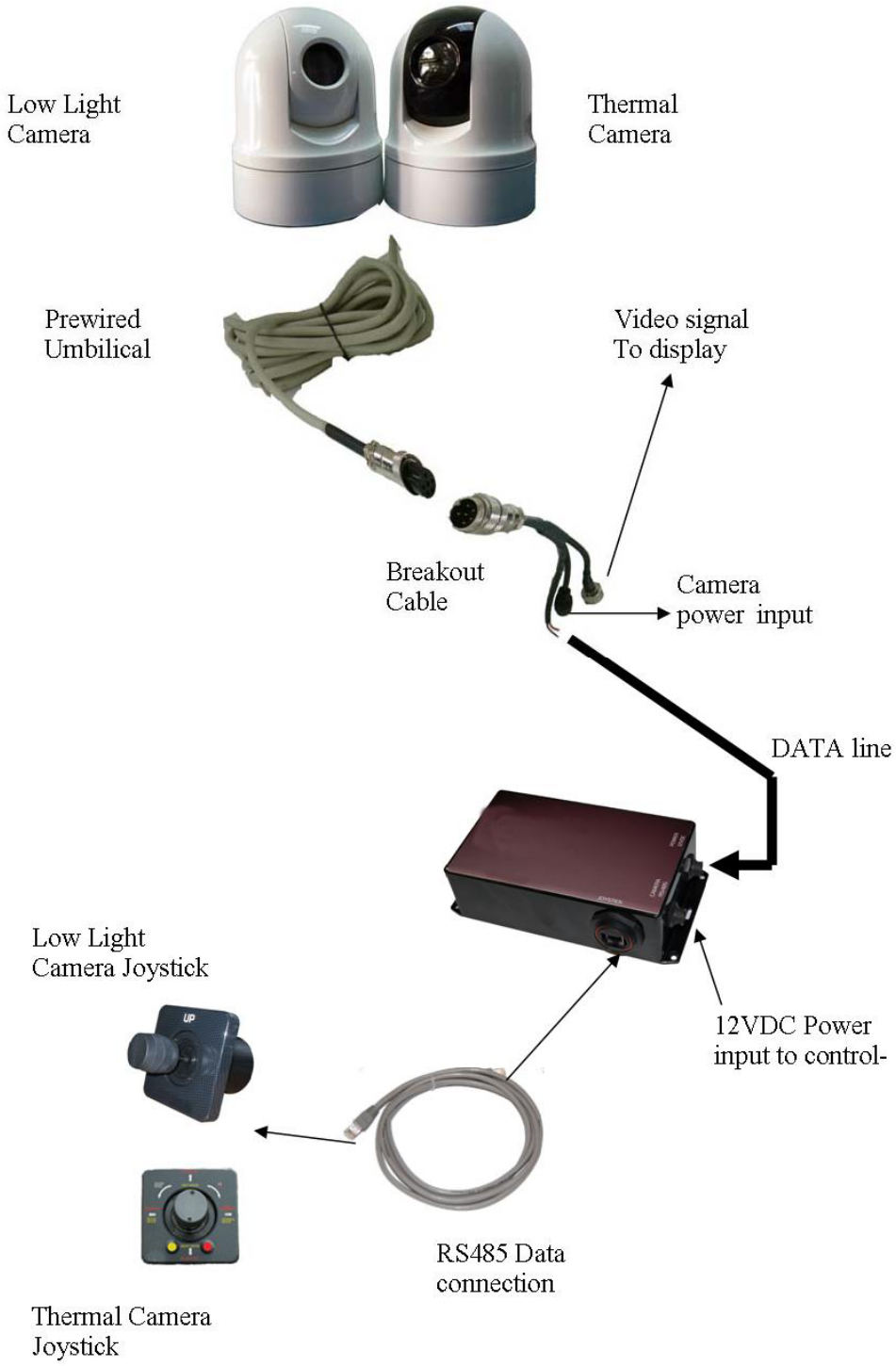


**Figure 1 – Typical camera systems setup (Low Light or Thermal)**

### Explorer V1T – Thermal Imaging Camera

The Explorer V1T Thermal imaging micro PTZ (pan, tilt, zoom) camera has been especially designed for practical and extreme applications such as marine, and emergency service vehicles.

In addition to its remarkably compact and sleek design, the system is water resistant and has anti-vibration and anti-corrosion properties. Special attention was given to the look and size of the device, understanding the need to offer boat owners high end technology that fits in with its surroundings and without compromising functionality. The High resolution 384 x 288 pixels (Total pixels 110, 592), boasts a picture resolution 44% greater than its rivals with a considerably fast pan and tilt speed.

Unlike conventional cameras, Thermal Imaging cameras sense the heat given off by objects or temperature differences rather than amplifying ambient light.

The camera engine inside the Explorer V1T is so sensitive that it can detect temperature differences as low as 50mK. Even ice emits thermal energy in the long wave infrared spectrum sensed by the camera. Thermal Imaging cameras process radiated, rather than reflected energy. Therefore, no source of illumination is required.

## Features:

The Explorer V1T is a feature packed devise that has been designed especially to provide the best possible situational awareness in a wide range of operation conditions. Some features are as follows:

- Full weather proof, anti vibration and anti-corrosion. IP66 certified.
- Compact integrated design with remote controllable telemetry.
- Random scan, cruise and pattern scan.*
- Continuous 360 degree pan, 180 degree tilt (90 degree with another 90 degree auto-flip).
- 100 user definable preset positions.*
- Proportional Pan / Tilt speed in accordance with degree of zoom.
- Various Colour Modes - White Hot, Black Hot, Ironbow, Reverse Ironbow
- User Selectable Situational Modes - Fog, Night, Marine and Man Over Board

* Not available with the basic style controller Joystick

## Proportional Pan and Tilt

Proportional pan automatically reduces or increases the pan and tilt speeds in proportion to the zoom level. At telephoto zoom, the pan and tilt speeds will be slower for a given amount of joystick deflection then at wide zoom level. This keeps the image from moving too fast on the monitor when there is a large amount of zoom.

## Preset Positions

(Not available with the basic style controller Joystick)

Up to 100 user defined camera positions can be stored in the cameras memory to be accessed individually or as part of a tour or cruise. Pan, Tilt, and Zoom values are stored when presets are stored. Autofocus is default for preset positions.

***NOTE**: Certain presets are assigned to activate other features such as patterns and image flip.*

## Auto Cruise

(Not available with the basic style controller Joystick)

Preset positions (up to 39) can be programmed into a tour. Once initiated, the camera will cruise through each preset position. (Presets 1~39 are included in the tour). Preset #82 initiates Auto Cruise. There's a 10 second dwell time between each preset. Auto Cruise loops once the last preset in the tour is completed, starting back at preset 1.

## Patterns

(Not available with the basic style controller Joystick)

Up to four patterns can be set, each controlling up to 10 preset positions. Patterns act like 'mini-tours'. Once initiated, the camera will move between preset positions in the pattern. Preset #84 starts pattern 1 (Preset #40 ~49), preset #85 starts pattern 2 (Preset #50~59), preset #86 starts pattern 3 (Preset #60~69), preset #87 starts pattern 4 (Preset #70~99). There is no dwell time between each preset. The camera will sequence back down through the presets once the last preset within the pattern is called.

### Explorer V1C – Low Light Camera

## Proportional Pan and Tilt

Proportional pan automatically reduces or increases the pan and tilt speeds in proportion to the zoom level. At telephoto zoom, the pan and tilt speeds will be slower for a given amount of joystick deflection then at wide zoom level. This keeps the image from moving too fast on the monitor when there is a large amount of zoom.

## Preset Positions

(Not available with the basic style controller Joystick)

Up to 100 user defined camera positions can be stored in the cameras memory to be accessed individually or as part of a tour or cruise. Pan, Tilt, and Zoom values are stored when presets are stored. Autofocus is default for preset positions.

***NOTE**: Certain presets are assigned to activate other features such as patterns and image flip.*

## Lens Control (Zoom, Focus, Iris)

**ZOOM:** Zoom Wide / Zoom Tele. Optical Zoom ratio 1 ~ 26. Digital Zoom x12 thereafter

**FOCUS:** Focus Near / Focus Far. By default system is auto-focus. After any manual changes to the focus, the camera will default to auto focus following any pan, tilt or zoom command.

**IRIS:** Open / Close. By default system is auto-iris. After any manual changes to the iris, the camera will default to auto iris following any pan, tilt or zoom command.

## Camera Feature Control

(Not available with the basic style controller Joystick)

Preset #92 is reserved to enter the OSD of the camera module allowing the user to adjust various parameters such as Back Light Compensation, Automatic White Balance, Sharpness, Picture Effects and Shutter Speeds.

## Auto Cruise

(Not available with the basic style controller Joystick)

Preset positions (up to 39) can be programmed into a tour. Once initiated, the camera will cruise through each preset position. (Presets 1~39 are included in the tour). Preset #82 initiates Auto Cruise. There's a 10 second dwell time between each preset. Auto Cruise loops once the last preset in the tour is completed, starting back at preset 1.

## Patterns

(Not available with the basic style controller Joystick)

Up to four patterns can be set, each controlling up to 10 preset positions. Patterns act like 'mini-tours'. Once initiated, the camera will move between preset positions in the pattern. Preset #84 starts pattern 1 (Preset #40 ~49), preset #85 starts pattern 2 (Preset #50~59), preset #86 starts pattern 3 (Preset #60~69), preset #87 starts pattern 4 (Preset #70~99). There is no dwell time between each preset. The camera will sequence back down through the presets once the last preset within the pattern is called.

## Scans (Auto, Random, Frame)

(Not available with the basic style controller Joystick)

**AUTO:** Camera scans through a 180° sweep, 90°left and 90°right of its current position. Preset #96 calls Auto Scan.

**RANDOM:** Camera scans randomly through 360° of its current position. Preset #97 calls Random Scan.

**FRAME:** Camera scans through a 90° sweep, 45°left and 45°right of its current position. Preset #98 calls Frame Scan.

## Image Flip

Inverts the video image vertically (Preset #88).

# Installation

# Installation

Please refer to the Warranty Information section of this manual before proceeding with installation of the Explorer V1T/V1C.

## Tools Required

General-purpose tools such as a portable drill, pliers, wire cutters, screwdrivers, wire, mounting bolts and wrenches may be required, as well as an accurate voltmeter or multi-meter.

**Hazard warning**

*Extreme caution is advised when using tools powered by Mains supply circuit (AC), regardless of whether those circuits are rated for "indoor", "outdoor", "marine" or "industrial" use. Water, especially sea water, is an excellent conductor of electricity. If AC tools are used, they must be plugged into a circuit that is adequately protected against Ground Faults and other safety hazards, and in accordance with local and national electric codes. Failure to comply may result is severe injury or death.*

*Battery powered tools are STRONGLY recommended*

## Power Supply

For reliable operation of your Explorer V1 Camera System, your vessel's power supply system must have an adequate breaker circuit, or fused DC (direct current) power supply at a nominal voltage of 12VDC. A power on/off switch is recommended.

Ensure that adequate wire size is used to handle the expected maximum currents.

***Note**: It is **strongly** recommended that the Explorer's power wiring be run directly from the power supply – especially for 12 Volt systems. The minimum supply voltage is specified as 9 Volts, at the camera connection point. If the voltage drops below 9 Volts, the camera system may exhibit erratic behaviour, such as periodic resetting.*

## Environmental Considerations

Ensure that the Explorer system Operating & Storage Temperature are within the acceptable range (see Specifications, Mechanical, on page 32).

The Explorer camera components: case, cable & mount are waterproof – but they are ***not*** submersible.

## Joystick Unit and Controller Unit

***Note**: Please take care when choosing the location of mounting the Joystick controller as it must be installed in the proximity of the Camera Controller unit, within 3 meters. Refer to the last page of the manual for a Joystick Mounting Template. You may tear this page out to use for marking the*

*mounting position and drill holes of the camera joystick controller*.

1. Make sure that the template is drilled out in a proper mounting position;
2. In an external mounting location, apply a sealant silicon bead on the under side of the joystick controller unit;
3. Position the Joystick unit in the correct orientation and place the unit into the opening;
4. Secure Joystick controller unit to the surface using the four (4) 5mm screws provided;
5. Connect the Cat5 STP cable to the socket at the bottom of the joystick unit, secure the cable with the screw on water seal socket cap;

> ***Note**: Unit controller must be positioned in an internal comportment, away from wet or moisture*

6. Position the controller unit in an appropriate spot and within 2.75 meters of the joystick unit and secure it with the provided screws.
7. Connect the Serial Data cable (3 pin connector) to the controller unit “CAMERA RS485” socket. This is a ¼ turn bayonet style connector. Align the connector and turn clockwise until locked;
8. Connect the Power Supply cable (2 pin connector) to the controller unit “POWER 12VDC” socket. This is a ¼ turn bayonet style connector. Align the connector and turn clockwise until locked;
9. Connect the Cat5 STP cable to the controller unit “JOYSTICK” socket. Secure the cable with the screw on water seal socket cap;

> ⚠ ***Warning**: Observe polarity when connecting the power cable to a power source. It is advisable to connect the power via a breaker or by the use of a fuse. Failure to comply may result in equipment damage*.

10. Connect the Power cable tail to a 12VDC power source. Connect Red wire to +12VDC and Black wire to Ground (-). The controller unit is rated at 12VDC, 1A.

## Camera Unit

> *Before drilling any holes, take care to ensure there are no cables, conduits, pipes etc. behind the surface to be drilled.*
> *Be sure to site your camera so that it covers all desired areas and does not obstruct any doorways or become a hazard in walkways etc.*
> *Allow sufficient space behind the surface to be drilled for routing the umbilical cable and its connector.*

1. Use the Surface Mount Fixing Plate as a template to mark camera position and drill mounting holes; For LowLight Camera, line label indicates zero point orientation (Pan). Make sure to align it to the vessel's bow;

> *Before the camera is fixed into place, set the appropriate camera address, protocol and baud rate. This is done via dip switches located behind a removable cover plate at the bottom of the camera*

2. Set camera address, communication protocol and baud rate according to the appropriate tables below (Table 3 & Table 4);
3. Route prewired umbilical cable through mounting plate hole and attach the camera to the mounting plate;
4. Secure the camera to the mounting plate using the Three (3) screws provided;
5. Position the Camera in its mounting locations and secure the mounting plate using the Three (3) screws provided;
6. Route the 3 Meter camera umbilical to the camera controller.
7. Connect the Umbilical breakout cable tail to the Camera's prewired umbilical cable. Secure cable with threaded connector;
8. Connect extension cables to the breakout tail if required. For a list of available extension and ordering information, please check the Ordering Information section, pages 34-35;
9. Connect Video cable (BNC Connector) to the input of the video display. An adaptor might be necessary to make such connection; video is in composite signal format.

> ⚠ ***Warning**: avoid crossing the Data cable with the Power cable when making electrical connections. Failure to comply may result in permanent equipment damage*.

10. Connect the RS485 Data cable of the Controller Unit to the RS485 cable of the Camera breakout tail (or extension). Take care to connect Red wire (RS485 A+) to Red and Black wire (RS485 B-) to Black;
11. Connect the 12VDC power to the camera power connector (2.1mm DC Barrel connector). Centre pin is +12VDC and outer ring is GND. If the connector is removed, make sure that the red wire is connected to +12VDC and the white wire to GND.

> ***Note**: If the barrel connector is utilized or replaced by another connector, make sure that it is protected from moisture and that an environmentally appropriate connector is used.*

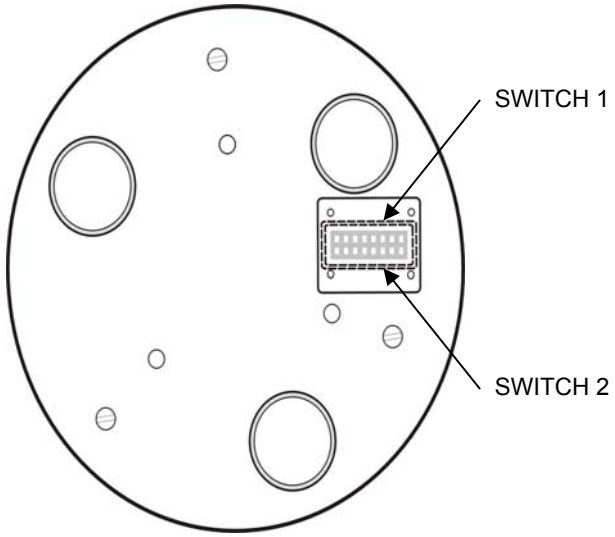


**Figure 2: Dip Switch location**

| Camera Address | SW1 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 0 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| 1 | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| 2 | OFF | ON | OFF | OFF | OFF | OFF | OFF | OFF |
| 3 | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF |
| 4 | OFF | OFF | ON | OFF | OFF | OFF | OFF | OFF |
| … | … | … | … | … | … | … | … | … |
| 253 | ON | OFF | ON | ON | ON | ON | ON | ON |
| 254 | OFF | ON | ON | ON | ON | ON | ON | ON |
| 255 | ON | ON | ON | ON | ON | ON | ON | ON |

**Table 3: Camera Address Setting**

| SW2 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| SW Position | 1 | 2 | 3 | 4 | | | | |
| Protocol | ON | OFF | OFF | OFF | User | | | |
| | OFF | ON | OFF | OFF | PELCO-P | | | |
| | ON | ON | OFF | OFF | PELCO-D | | | |
| | OFF | OFF | ON | OFF | Reserved | | | |
| | ON | OFF | ON | OFF | Reserved | | | |
| | OFF | ON | ON | OFF | Reserved | | | |
| SW Position | | | | | 5 | 6 | 7 | 8 |
| Baud Rate (BPS) | 1200 | | | | ON | OFF | OFF | - |
| | 2400 | | | | OFF | ON | OFF | - |
| | 4800 | | | | ON | ON | OFF | - |
| | 9600 | | | | OFF | OFF | ON | - |
| | 19200 | | | | ON | OFF | ON | - |
| | Reserved | | | | OFF | ON | ON | - |
| Image Flip | Desktop Installation | | | | - | - | - | OFF |
| | Reverse Installation | | | | - | - | - | ON |

**Table 4: Baud Rate, Protocol and Camera Flip Setting**

***Note**: Reboot the Camera after any configuration change*

## Operation

## Low Light Camera

***Note**: Prior to powering up, ensure that all the cables and connectors are properly connected and secured.*

### Camera Movement

1. Moving the Joystick Up/Down moves the camera head in the tilt direction, Up/Down respectively;
2. Moving the Joystick Left/Right moves the camera head in the pan direction, Left/Right respectively;

The joystick controller is geared so that the pan, tilt and zoom speed increases progressively away from the central position. The closer the centre point, the slower the control, the further away, the faster the control. The camera will automatically calculate the degree of zoom and gear the control so that the pan and tilt speed reduces.

### Zoom Control

1. Zoom In – Twist the joystick head clockwise;
2. Zoom Out – Twist the joystick head counter clockwise.

## Thermal Imaging Camera

### Camera Movement

1. Moving the Joystick Up/Down moves the camera head in the tilt direction, Up/Down respectively;
2. Moving the Joystick Left/Right moves the camera head in the tilt direction, Left/Right respectively;

The joystick controller is geared so that the pan, tilt and zoom speed increases progressively away from the central position. The closer the centre point, the slower the control, the further away, the faster the control. The camera will automatically calculate the degree of zoom and gear the control so that the pan and tilt speed reduces.

### Zoom Control

1. Zoom In – for 2X zoom, twist the joystick head clockwise. For 4X zoom, press on the Red button when twisting the joystick head clockwise;
2. Zoom Out – Twist the joystick head counter clockwise for Wide Zoom.

### Contrast Mode Selection

1. Press and hold the White button;
2. While the White button is pressed, move the joystick head in any of the four directions: Left for Man Over Board M.O.B, right for Fog Mode, Up for Marina mode and down for night mode.
3. Release the button once selection is made. Joystick will defaults back to standard Tilt/Pan Joystick functions.

### Colour Palette Selection

1. Press and hold the Red button;
2. While the Red button is pressed, move the joystick head in any of the four directions: Left for Ironbow right for Reverse Ironbow, Up for White Hot and down for Black Hot.
3. Release the button once selection is made. Joystick will defaults back to standard Tilt/Pan Joystick functions.

# Care & Maintenance

# Care & Maintenance

The Explorer V1T and V1C Camera System have been designed to provide many years of reliable service. The following care and maintenance tips will help to ensure the longevity of the equipment.

## Protection of Wires and Cabling

After installation, ensure that the system's components are securely mounted and will not shake loose with the vibrations that are expected in a marine vessel.

Ensure that the cables to the equipment are well secured with clamps and/or alternative fasteners.

Many potential problems can be avoided by ensuring that cables and wiring do not cause any connectors strain.

## Periodic Checks

After the first six months of operation, a thorough examination of the entire Camera system MUST BE UNDERTAKEN. Verify that all electrical connections, cables, clamps, mounting brackets, and mechanical connections are secure.

An annual inspection should be undertaken thereafter.

## General Precautions

A few precautions will keep the unit in prime condition:

- The Camera and control enclosures do not require any special maintenance. An occasional cleaning is suggested; use a damp cloth and mild soap.

  ***Note**: Do not use abrasive cleaners or chemicals. Improper Care can cause damage to the lens cover coating, degrade the camera's performance and may void the warranty.*

- Avoid exposing the enclosure to solvents, acids, and bases – some of these may weaken the plastic.
- The Camera and control enclosures are designed to be weatherproof and splash resistant, Do not immersed in water.
- Avoid environments exceeding a temperature of 85°C or below -40°C.

## Repair

There are no user serviceable parts inside the Camera or controller enclosures. Should the unit become damaged in any way, Contact an authorized ComNav dealer.

## Fuse Replacement

There are no fuses used inside the camera or controller unit. However, it is strongly recommended that a fuse (or circuit breaker) be used when installing the equipment.

*If the fuse/breaker blows, determine the cause before replacing or resetting*

## Cleaning

Clean the camera window only with low-pressure fresh water and a soft

cloth. For water spots, wipe the lens cover with a clean, fresh water dampened lens cloth.

# Appendices

# Appendix 1

## Specifications

| Part Number | 21610007/8 | 21610009/10 | 216100011/12 | 216100013/14 |
|---|---|---|---|---|
| Description | Uncooled Thermal Imaging Camera 160mm x 130mm˚. 9Hz Frame Rate Resolution: 384x288 | Uncooled Thermal Imaging Camera 160mmx130mm˚. 30Hz* Frame Rate Resolution: 384x288 | Uncooled Thermal Imaging Camera 160mm x 130mm˚. 9Hz Frame Rate Resolution: 640x480 | Uncooled Thermal Imaging Camera 160mmx130mm˚. 30Hz* Frame Rate Resolution: 640x480 |
| Thermal Engine | Uncooled Amorphous Silicone (a-Si) Microbolometer Thermal Core | | | |
| Total Effective Pixels | 110,592 | | 307,200 | |
| Thermal Sensitivity | <50mK | | 70mK | |
| Pixel Pitch | 25µ | | 17µ | |
| Spectral Response | 8µm ~ 14µm | | 8µm ~ 12µm | |
| D.R.I Ranges | Detect: 375m Recognize: 95m Identify: 47m (Based on target 2.3m x 2.3m using 15mm Fixed Lens, 35˚ Horizontal Angle of View) | | Detect: 1150m Recognize: 383m (Based on target 2.3m x 2.3m using 19mm Fixed Lens, 29˚ Horizontal Angle of View) | |
| Pan / Tilt Range | Pan: 0~360˚ continuous - Tilt: -15˚~90˚ with auto flip to self right camera orientation | | | |
| Pan / Tilt Speed | Pan:0.05~240˚/sec - Tilt: 0.03~160˚/sec | | | |
| Colour Palettes / | Grey Scale (White Hot / Back Hot), Red-Black, Iron Bow, Reverse Iron Bow | | | |
| Operating Modes | 5 x Preset Contrast Modes: Day Running, Night Running, Fog Mode, Marina Mode, Man Over Board Mode | | | |
| Telemetry | Pelco D / Comnav Propriety Protocol Mapping | | | |

**Table 5 – Thermal Camera System Receiver Specifications**

* 30Hz for NTSC and 25Hz for PAL systems.

### *System Interface*

| Parameter | Specification |
|---|---|
| Communication | • RS-485 (V1C and V1T);<br>• Bespoke; |
| Baud Rate | 4800 (default), 9600, 19200 and 38400 |
| Video Output | 1X BNC 1V P-P / 75Ω Composite |

**Table 6 – System Interface Specifications**

### *Power*

| Parameter | Specification |
|---|---|
| Supply Voltage | 9 to 15 VDC |
| Power Output | Up to 1 A (max) @ 12 VDC |
| Power Consumption | 15 W Max, |

**Table 7 – Power Specifications**

### *Mechanical*

| Parameter | Specification |
|---|---|
| Dimensions | 16 cm (H) x 13 cm (D)<br>(6.3 in. x 5.1 in.) not including mount |
| Weight | 1.2 Kg |
| Enclosure Rating | IP 66 |
| Operating Temperature | -25°C to +70°C |
| Storage Temperature | -40°C to +80°C |
| Relative Humidity | 5% to 90% |
| Shock Resistance | Mil-PRF-28800F, Class 2 Section 4.5.5.3.1 |
| Vibration Resistance | Mil-PRF-28800F, Class 2 Section 4.5.5.4.1 |
| Compliance | CE, FCC, RoHS |
| Lens | 15mm Fixed |
| Data cable length | • standard:<br>o 15 metres (50 feet),<br><br>*(custom lengths are available)* |

**Table 8 – Mechanical Specifications**

# Appendix 2

## Ordering Information

| Part # | V1 DIGITALLY RATE STABILIZED THERMAL CAMERAS - NTSC |
|---|---|
| 11610004 | Explorer V1C Low Light Camera, NTSC, c/w JCU, 15m extension cable, flush mount plate & hardware |
| 11610006 | Explorer V1T Thermal Image Camera, NTSC, 9Hz, 384x288Res, c/w JCU 15m extension cable, flush mount plate & hardware |
| 11610008 | Explorer V1T Thermal Image Camera, NTSC, 25Hz, 384x288Res, c/w JCU, 15mextension cable, flush mount plate & hardware |
| 11610010 | Explorer V1T Thermal Image Camera, NTSC, 9Hz, 640x480Res, c/w JCU 15m extension cable, flush mount plate & hardware |
| 11610012 | Explorer V1T Thermal Image Camera, NTSC, 25Hz,640x480Res, c/w JCU, 15m extension cable, flush mount plate & hardware |
| 11610014 | Explorer V1 Dual Camera System, NTSC, 9Hz, 384x288Res, c/w JCU, 15m extension cable, flush mount plate & hardware |
| 11610016 | Explorer V1 Dual Camera System, NTSC, 25Hz, 384x288Res, c/w JCU, 15m extension cable, flush mount plate & hardware |
| 11610018 | Explorer V1 Dual Camera System, NTSC, 9Hz, 640x480Res, c/w JCU, 15m extension cable, flush mount plate & hardware |
| 11610020 | Explorer V1 Dual Camera System, NTSC, 25Hz, 640x480Res, c/w JCU, 15m extension cable, flush mount plate & hardware |
| | **V1 DIGITALLY RATE STABILIZED THERMAL CAMERAS - PAL** |
| 11610005 | Explorer V1C Low Light Camera, PAL, c/w JCU, 15m extension cable, flush mount plate & hardware |
| 11610007 | Explorer V1T Thermal Image Camera, PAL, 9Hz, 384x288Res, c/w JCU, 15m extension cable, flush mount plate & hardware |
| 11610009 | Explorer V1T Thermal Image Camera, PAL, 25Hz, 384x288Res, c/w JCU, 15m extension cable, flush mount plate & hardware |
| 11610011 | Explorer V1T Thermal Image Camera, PAL, 9Hz, 640-480Res, c/w JCU, 15m extension cable, flush mount plate & hardware |
| 11610013 | Explorer V1T Thermal Image Camera, PAL, 25Hz, 640x480Res, c/w JCU, 15m extension cable, flush mount plate & hardware |
| 11610015 | Explorer V1 Dual Camera System, PAL, 9Hz, 384x288Res, c/w JCU, 15m extension cable, flush mount plate & hardware |
| 11610017 | Explorer V1 Dual Camera System, PAL, 25Hz, 384x288Res, c/w JCU, 15m extension cable, flush mount plate & hardware |
| 11610019 | Explorer V1 Dual Camera System, PAL, 9Hz, 640x480Res, c/w JCU, 15m extension cable, flush mount plate & hardware |
| 11610021 | Explorer V1 Dual Camera System, PAL, 25Hz, 640x480Res, c/w JCU, 15m extension cable, flush mount plate & hardware |
| | **V1 ACCESSORIES** |
| 21610003 | Explorer V1C Joystick Controller c/w 3m STP Cable |
| 21610004 | Explorer V1T Joystick Controller c/w 3m STP Cable |
| 21610005 | Explorer V1C Low Light Camera, NTSC, c/w 3m cable |
| 21610007 | Explorer V1T Thermal Image Camera,NTSC, 9Hz, 384x288Res c/w 3m cable |
| 21610009 | Explorer V1T Thermal Image Camera,NTSC, 25Hz, 384x288Res c/w 3m cable |
| 21610011 | Explorer V1T Thermal Image Camera,NTSC, 9Hz, 640x480Res c/w 3m cable |
| 21610013 | Explorer V1T Thermal Image Camera,NTSC, 25Hz, 640x480Res c/w 3m cable |
| 21610006 | Explorer V1C Low Light Camera, PAL, c/w 3m cable |

| | |
|---|---|
| 21610008 | Explorer V1T Thermal Image Camera, PAL, 9Hz, 384x288Res c/w 3m cable |
| 21610010 | Explorer V1T Thermal Image Camera PAL, 25Hz, 384x288 Res c/w 3m cable |
| 21610012 | Explorer V1T Thermal Image Camera PAL, 9Hz, 640x480Res c/w 3m cable |
| 21610014 | Explorer V1T Thermal Image Camera, PAL, 25Hz, 640x480 Res c/w 3m cable |
| 31610004 | 15m extension cable for Explorer V1C & V1T Camera System |
| 31610035 | 25m extension cable for Explorer V1C & V1T Camera System |
| 31610006 | Flush Mount Plate for V1C & V1T Camera System |
| 31610032 | Adjustable Arm Bracket for V1C & V1T Camera System |
| 31610033 | Recess Mount Bracket for V1C & V1T Camera System |
| 31610027 | 7" Combined Waterproof Monitor/4 Channel Quad Splitter |
| 31610029 | 4 Channel Digital Video Recorder, 120GB |
| 31610030 | 8 Channel Digital Video Recorder, 160GB |
| 31610031 | Video Distribution Amplifier/1 Input to 4 Output |
| 29010088 | Installation & Operation Manual |

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## Warranty Information

### Limited Warranty

This Limited Warranty (the “Warranty”) covers all Explorer V1 Series Camera products & accessories (the “Equipment”) sold by ComNav Marine Ltd. (“ComNav”).

### LIMITED TWO YEAR WARRANTY

ComNav warrants to the Purchaser, provided that the recommended installation and maintenance procedures set forth in the manual (the “Manual”) provided with the Equipment have been followed, and subject always to the other provisions of this Warranty, that the Equipment is free from defects in workmanship and materials under normal use and service for a period of two (2) year from the date of purchase of the Equipment by the Purchaser.

### EXCLUSIONS

This Limited Warranty is null and void if:

1. The serial number of the Equipment has been removed, altered or mutilated;
2. Any of the anti-tamper seals covering case-screw holes, or other mechanisms for opening the Equipment’s case, have been removed, broken or otherwise tampered with;
3. There are any defects in it, or damages to it, caused by:
    a. Faulty installation or hook-up of the Equipment;
    b. Abuse, misuse, or any use of the Equipment in violation of the instructions set forth in the Manual;
    c. Shipping, alterations, or incorrect and/or unauthorized service;
    d. Accident, exposure of the Equipment to excessive heat, fire, lightning or other electrical discharge, or water immersion;
    e. Water damage due to failure to fully fasten the plug connected into the equipment’s power/signal receptacle;
    f. Improper or inadequate ancillary or connected equipment.

### OTHER LIMITATIONS AND EXCLUSIONS

1. The Equipment is not intended for primary navigation or for use in safety of life applications; ComNav does not warrant or guarantee that the Equipment will perform in accordance with the requirements of such usage;
2. ComNav reserves the right to modify the Equipment without any obligation to notify, supply or install any improvements or alterations to existing Equipment.

### NO OTHER WARRANTIES

THE FOREGOING WARRANTY IS EXCLUSIVE OF ALL OTHER WARRANTIES AND CONDITIONS, WHETHER WRITTEN, ORAL OR IMPLIED, ARISING BY STATUTE OR OTHERWISE, WITH RESPECT TO THE DESIGN, SALE, INSTALLATION OR USE OF THE

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**LIMITATION OF LIABILITY**

The extent of ComNav's liability for damages of any nature to the end purchaser or any other person or entity whether in contract or tort, and whether to persons or property, shall in no case exceed, in the aggregate, the cost of correcting the defect in the equipment or, at ComNav's option, the cost of replacing the defective item. In no event will ComNav be liable for any loss of production, loss of profits, loss of use or for any special, indirect, incidental, consequential or contingent damages, even if ComNav has been advised of the possibility of such damages. Without limiting the foregoing, ComNav shall not be liable for any damages of any kind resulting from installation, use, quality, performance or accuracy of the equipment.

**NOTICE OF DEFECT**

The Limited Warranty will not apply with respect to any defective Equipment unless written notice of such defect is given to ComNav, by mail to the address for ComNav set forth below, or by facsimile to ComNav at 604-207-8008, and unless that written notice is received by ComNav within ten (10) days of the date upon which the defect first became known to the Purchaser.

Notices sent by mail from within North America will be deemed to be received by ComNav on the seventh (7th) day first following the date of posting. Notices sent by mail from anywhere else in the world will be deemed to be received by ComNav on the tenth (10th) day next following the date of posting. Notices sent by facsimile will be deemed to be received by ComNav on the date of transmission with appropriate answerback confirmation.

**REMEDIES NOT TRANSFERABLE**

The Purchaser's remedies under this Warranty apply only to the original end-user of the ComNav Equipment, being the Purchaser, and apply only to the original installation of the Equipment. The Purchaser's remedies under this Warranty are not transferable or assignable by the Purchaser to others in whole or in part.

**CUSTOMER REMEDIES**

1. If the Equipment, or any part thereof, proves to be defective within the warranty period, the Purchaser shall do the following:
    a. contact ComNav, by phoning 604-207-1600, to discuss the nature of the problem and to obtain return shipping instructions for the defective Equipment;and,
    b. prepare a detailed written statement of the nature and circumstances of the defect, to the best of the Purchaser's knowledge, and including the date of purchase of the Equipment, the place of purchase, the name and address of the installer, and the Purchaser's name, address and telephone number, all to be sent, along with proof of purchase, to ComNav at the address set out below, and within the time limits set out above for Notice of Defect.
2. If, upon examination by ComNav, the defect is determined to result from defective workmanship or material and if the defect has occurred within the warranty period set forth above, the Equipment or the defective parts thereof shall be repaired or replaced, at ComNav's sole option,

without charge, and shall be returned to the Purchaser at ComNav's expense. Return delivery will be by the most economical means. Should the Purchaser require that the Equipment be returned by a faster method, the costs incurred by the faster delivery will be pre-paid by the Purchaser.

3. No refund of the purchase price for the Equipment will be made to the Purchaser unless ComNav is unable to remedy the defect after having a reasonable number of opportunities to do so.
4. Warranty service shall be performed only by ComNav. Any attempts to remedy the defect by anyone else shall render the warranties set forth in this Warranty null and void.

**CHOICE OF LAW AND JURISDICTION**

This Warranty is governed by the laws of the Province of British Columbia, Canada. If the Purchaser acquired the Equipment outside of Canada, each of the parties hereto irrevocably attorn to the jurisdiction of the courts of the Province of British Columbia, Canada, and further agree to settle any dispute, controversy or claim arising out of or relating to this Limited Warranty, or the breach, termination, or invalidity of it, by arbitration under the rules of the British Columbia International Commercial Arbitration Centre ("BCICAC"). The appointing authority shall be BCICAC [or, if the BCICAC shall cease to exist, the Chief Justice of the Supreme Court of British Columbia]. BCICAC shall administer the case in accordance with BCICAC Rules. There shall be one arbitrator and the place of arbitration shall be Vancouver, British Columbia, Canada.

The United Nations Convention on Contracts for the International Sale of Goods Act, S.B.C 1990, c. 20, and any other statutory enactments of the United Nations Convention on Contracts for the International Sale of Goods do not apply to this Warranty.

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***WARNING***

The Equipment is an aid to navigation only. It is not intended or designed to replace the person on watch. A qualified person should always be in a position to monitor the vessel's heading, and to watch for navigational hazards, and should be prepared to revert to manual steering immediately if an undesired change of heading occurs, if the heading is not maintained within reasonable limits, or when navigating in a hazardous situation.

**ALWAYS REMEMBER:**

WHENEVER UNDER WAY, A QUALIFIED PERSON ON WATCH IS REQUIRED BY LAW.

# User Notes

## Notes

# 31610016/18 Joystick Mounting Template